mathematical methods - week 9

Finite groups

Georgia Tech PHYS-6124

Homework HW #9   due Thursday, October 30, 2014

== show all your work for maximum credit,
== put labels, title, legends on any graphs
== acknowledge study group member, if collective effort

Exercise 9.1 *Permutation of three objects*   3 points
Exercise 9.2 *An arrangement of five particles*   7 points
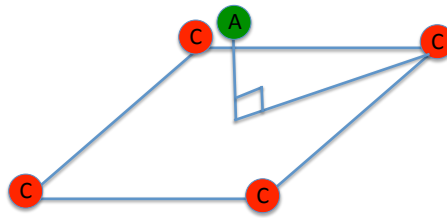
Total of 10 points = 100 % score.

Figure 9.1: 4 identical particles of type C lie on the vertex of a square. In the center of the square, but out of the plane, is a particle of type A.   (K. Y. Short)

2014-10-16 Predrag Lecture 17 Finite groups

Exercises

9.1. **Permutation of three objects.**   Consider S_3, the group of permutations of 3 objects.

    (a) Show that S_3 is a group.

    (b) List the equivalence classes of S_3?

    (c) Give an interpretation of these classes if the group elements are substitution operations on a set of three objects.

    (c) Give a geometrical interpretation in case of group elements being symmetry operations on equilateral triangle.

9.2. **Arrangement of five particles.**   Consider the following arrangement of particles: On each corner (vertex) of a square lies a particle C; in the center of the square, but out of the plane, is a particle A, as in figure 9.1.

    (a) What are the symmetries of this arrangement?

    (b) Find its multiplication table.

    (c) Find its subgroups. Which subgroups are self-conjugate?

    (d) What are the equivalence classes?